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Fitzpatrick

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[54] **QUICK CHANGE VISE JAW**

[76] Inventor: **John P. Fitzpatrick,** 17174 Buckingham, Birmingham, Mich. 48009

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[52] **U.S. Cl.** **269/282**

[58] **Field of Search** 269/279, 280, 282–284, 269/246, 247, 285

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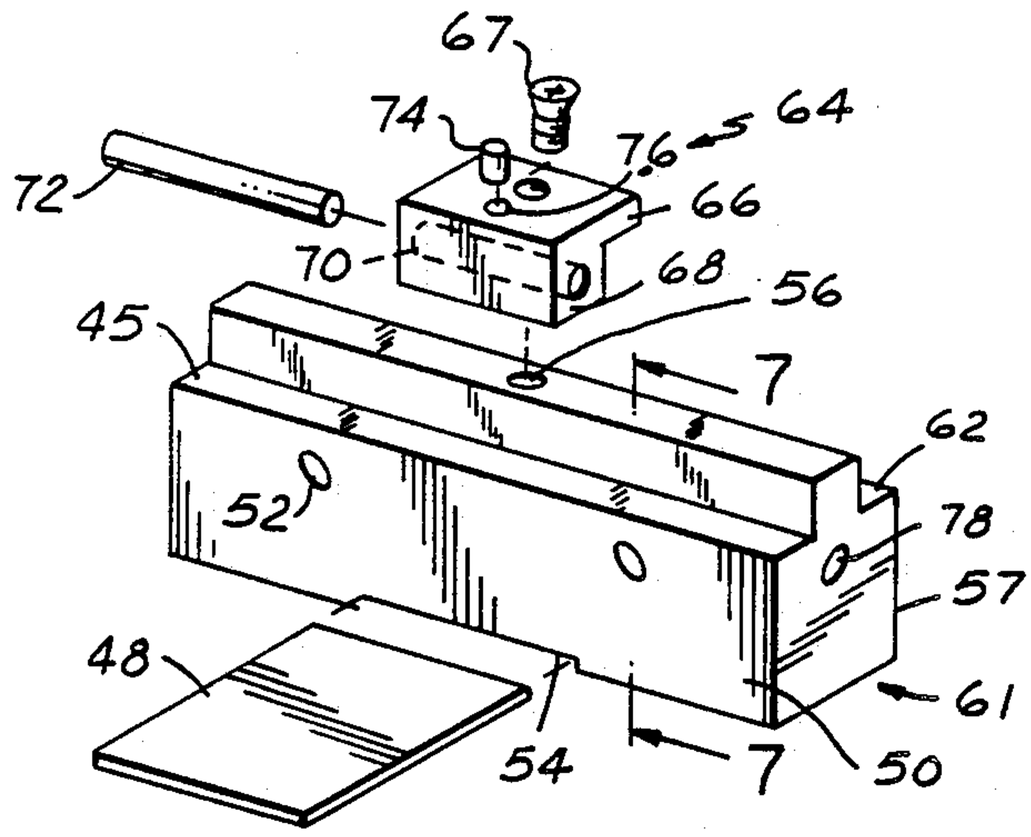
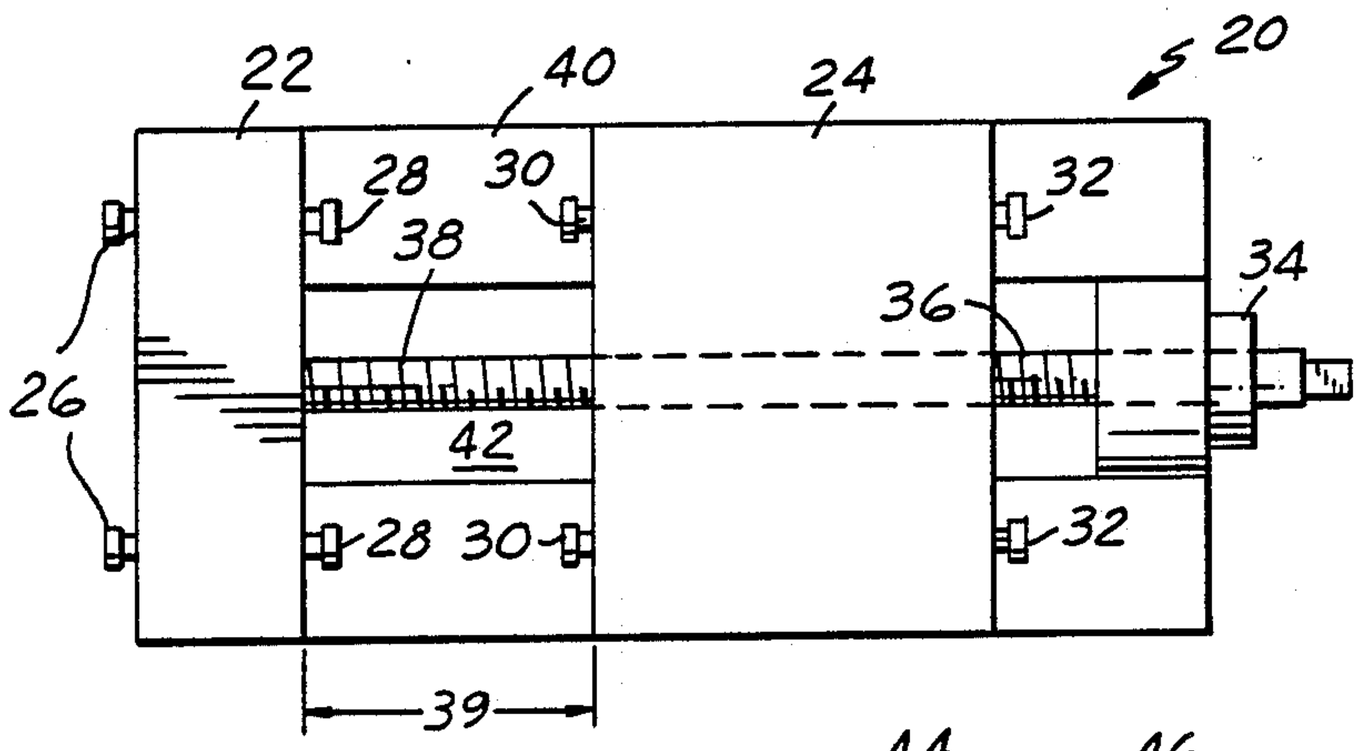
Primary Examiner—Robert C. Watson
Attorney, Agent, or Firm—Dykema Gossett

[57] **ABSTRACT**

An improved vise jaw is disclosed that can be quickly mounted upon a standard vise to facilitate efficient assembly of a machining run. The vise jaw comprises a T-shaped slot at an attachment face for receiving a mounting bolt from the vise. An access opening extends forwardly to a clamping face allowing access of a tool for tightening the bolt within the T-shaped opening to secure the vise jaw to the vise. A chip shield is disclosed that extends between opposed vise jaws to cover a screw threaded member that moves the clamping plates with respect to each other. The chip shield prevents machining waste from reaching the screw threaded member and saves a large amount of time in required clean-up after a machining operation.

16 Claims, 2 Drawing Sheets





(PRIOR ART)

FIG. 1

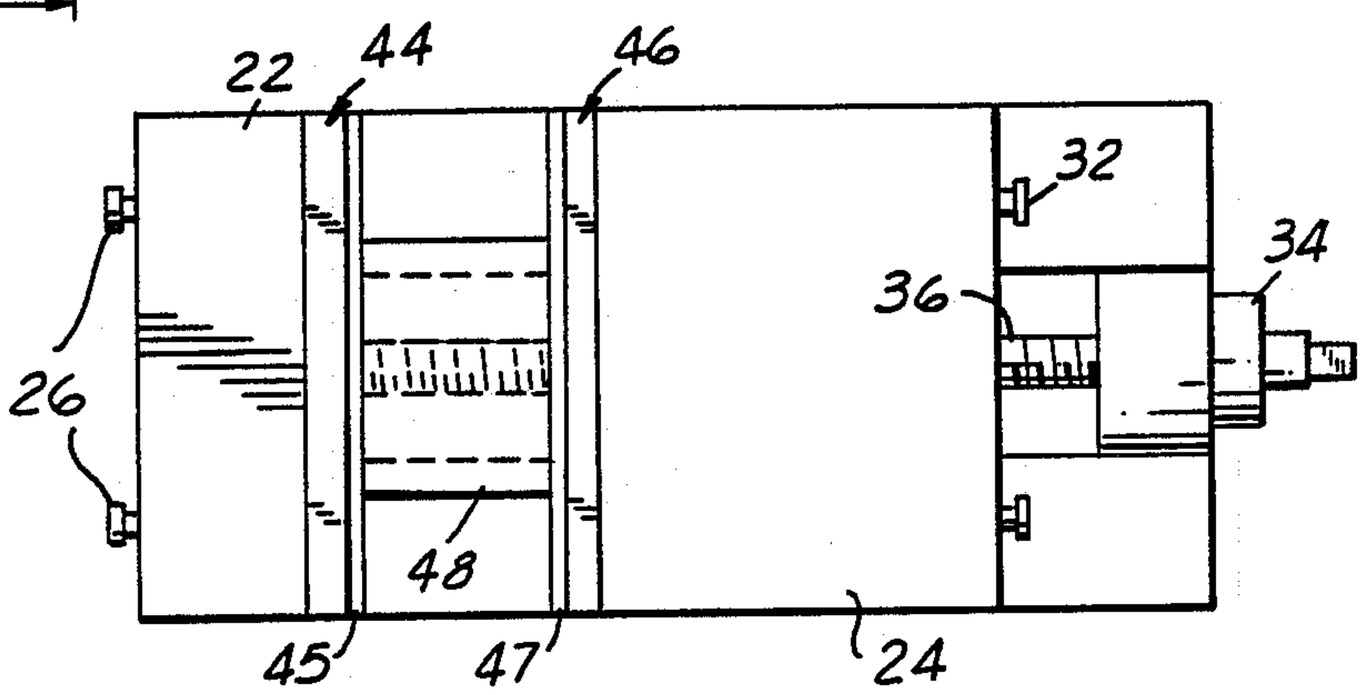


FIG. 2

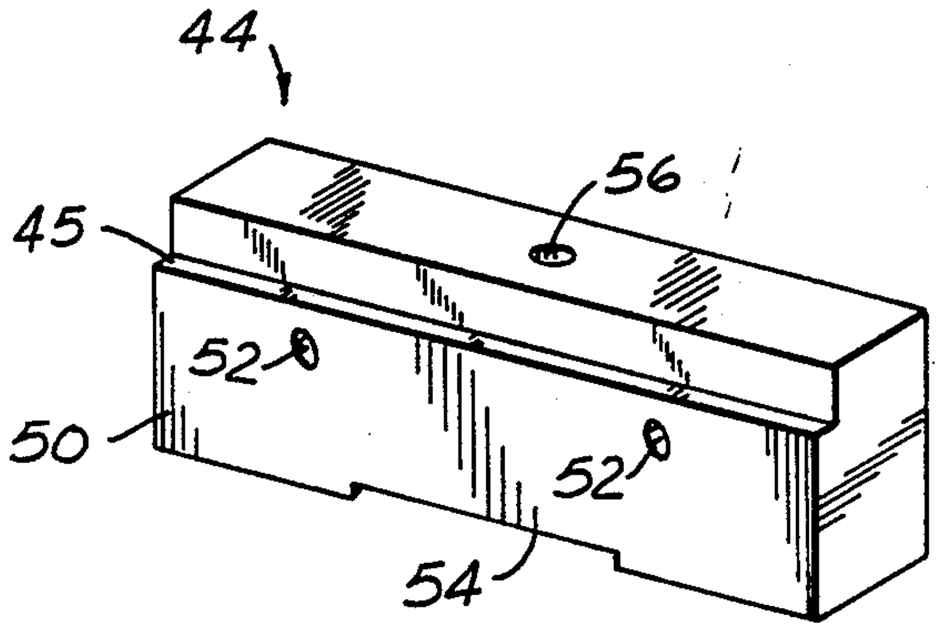


FIG. 3

FIG. 5

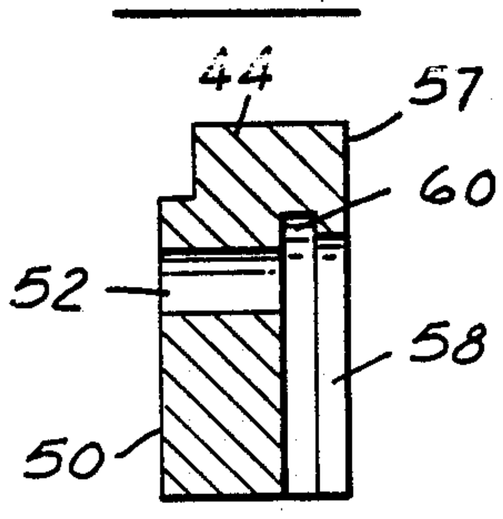
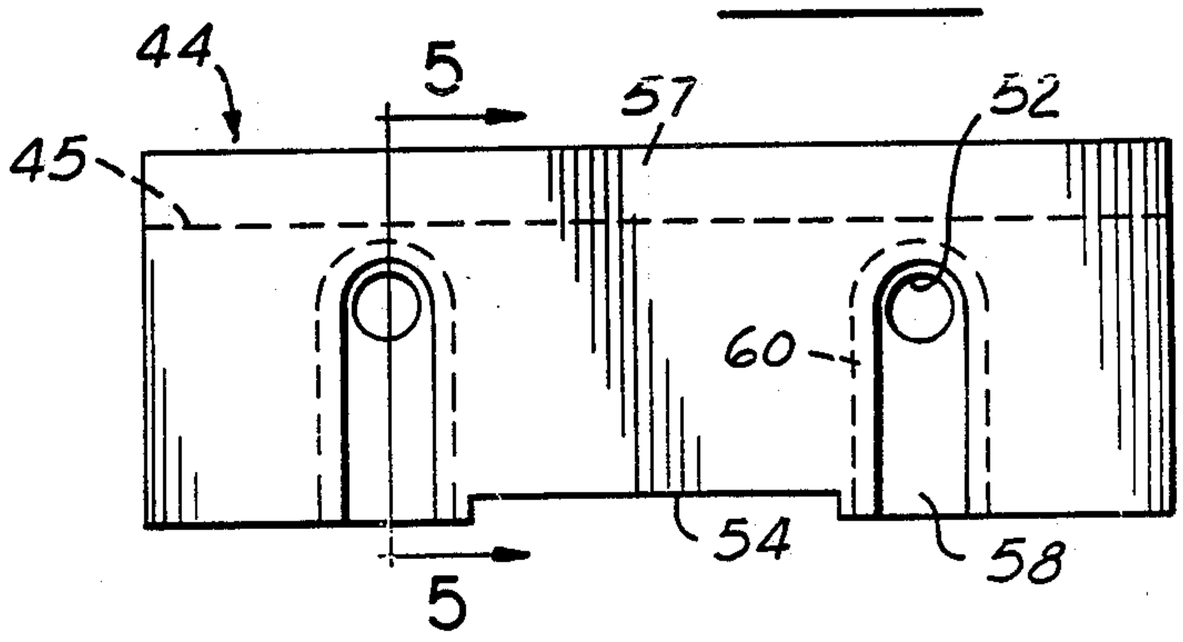


FIG. 4



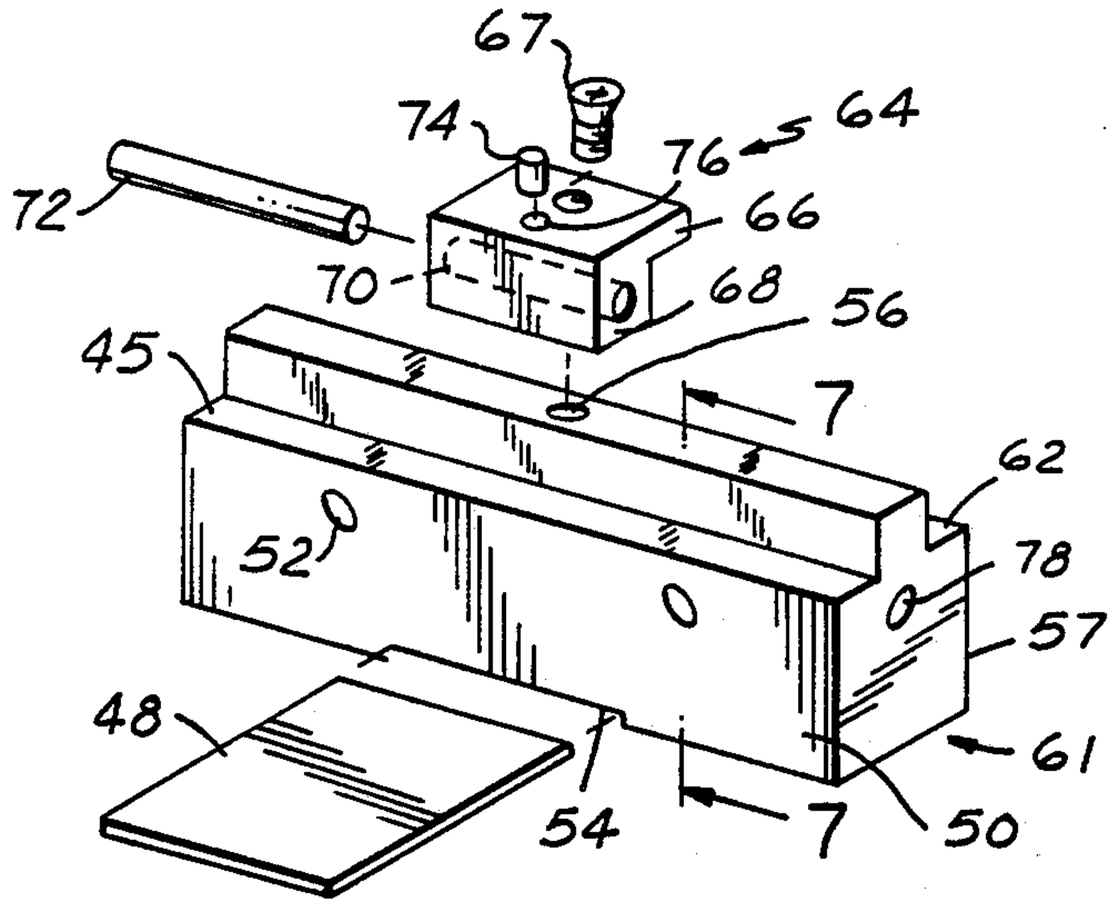


FIG.6

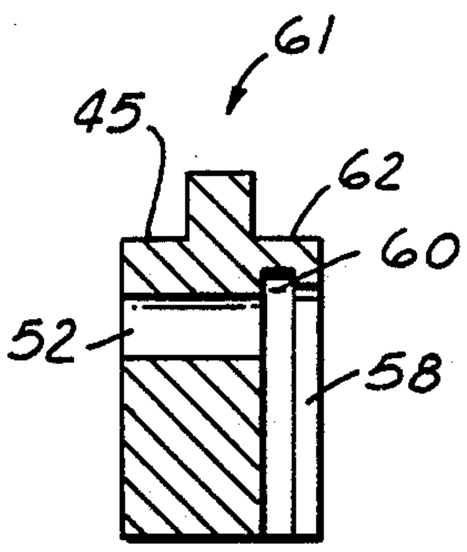


FIG.7

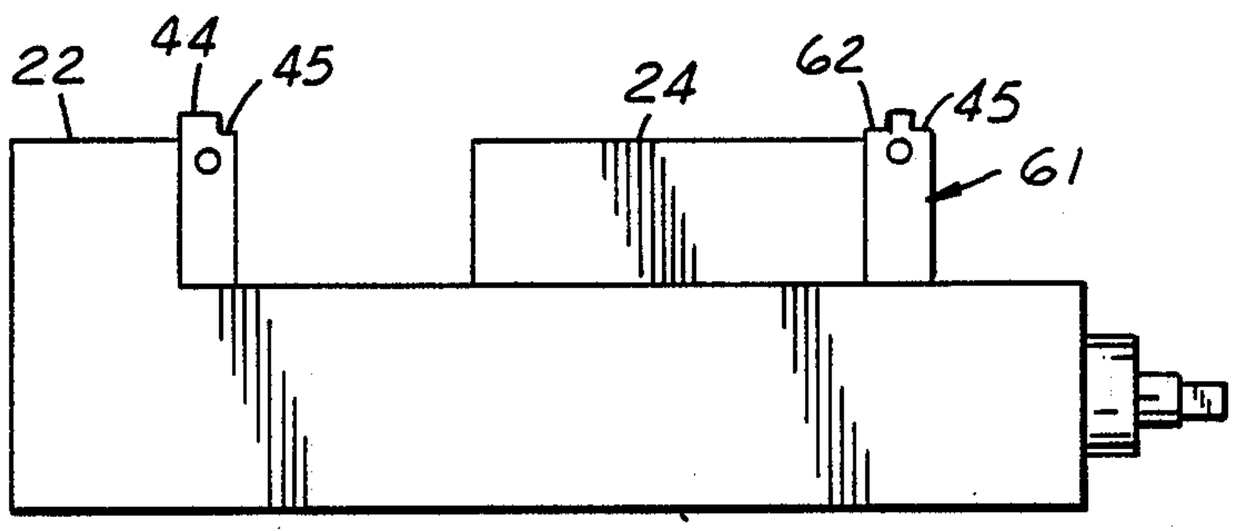


FIG.8

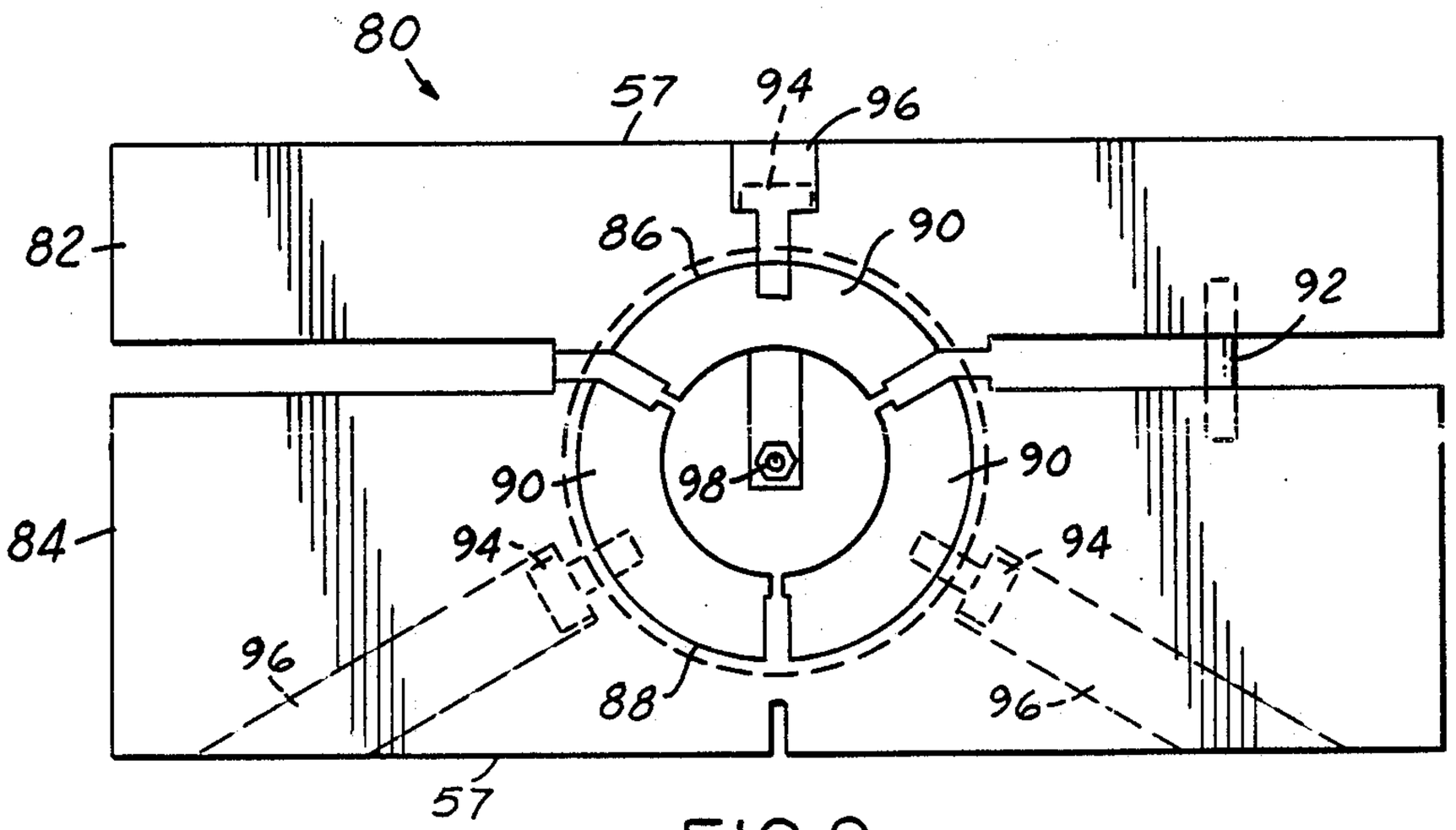


FIG.9

QUICK CHANGE VISE JAW

BACKGROUND OF THE INVENTION

This invention relates to a quick release vise jaw that embodies several unique features.

In modern machine shops, parts are typically machined by computer controlled tools in large runs or amounts. The set-up of these parts into the various vises that must hold the parts while being machined is still essentially a manually performed task. Among the steps that are required in assembling a vise for holding a part is the provision of a vise jaw on mounting bolts that are attached to the vise that actually grips the part. In some machining tasks, there may be dozens of vise jaws that must be mounted upon vises in order to set up the machining run. The manual mounting of the prior art vise jaws to the vises is a slow process that requires large amounts of labor and time to be expended.

Prior art quick release vise jaws have been developed that require reduced mounting time, however, in general they reduce the clamping surface area of the vise jaw. In some prior art vise jaws the quick release feature results in an opening at a clamping ledge that reduces clamping surface area. Also, these prior art vise jaws reduce the available clamping depth, which is the vertical extent of the clamping ledge that actually holds a part for machining. Reducing the clamping surface area may result in parts being improperly secured, misaligned or twisted.

It has been known to use T-shaped slots to mount a vise jaw to a bolt on a vise. However, these prior art vise jaws may not adequately secure the vise jaws to the vise, nor are they necessarily adaptable to modern vises.

An example of a type of vise that is most widely utilized in the modern machine tool industry is illustrated in Prior Art FIG. **1**. As shown in FIG. **1**, vise **20** comprises first plate **22** and second plate **24**. A pair of outside bolts **26** and a pair of inside bolts **28** are fixed to first plate **22** and a pair of inside bolts **30** and a pair of outside bolts **32** are fixed to second plate **24**. A moving mechanism **34**, which includes threaded screw member **36** serves to adjust the distance between first plate **22** and second plate **24**. Threaded screw member **36** has a variable exposed portion **38** between first plate **22** and second plate **24** which also defines a variable clamping distance **39**. Exposed portion **38** is located below base surface **40** of vise **20**, in ditch **42**. Moving mechanism **34** adjusts the clamping distance **39** by moving second plate **24** towards and away from first plate **22**.

With this type of prior art vise it is difficult to quickly and securely mount a vise jaw to the bolts on plates **22** and **24**, and in addition, exposed portion **38** of threaded screw member **36** is exposed to machining wastes, such as chips, during machining operations. A burdensome clean-up is required when machining waste reaches exposed portion **38** of screw threaded member **36**.

Thus, it is an object of the present invention to achieve a vise jaw arrangement that will be securely and quickly mounted to the bolts in a standard vise and at the same time will shield the threaded screw member from exposure to machining waste.

SUMMARY OF THE INVENTION

The present invention achieves a securely and quickly mounted vise jaw with the provision of a T-shaped slot extending from a first face of the vise jaw and having an access opening extending through to a second clamping face to allow a wrench or the like to access and tighten a bolt within the T-shaped slot. Due to the access opening, the bolts in the vise plates may be quickly tightened to securely hold the vise jaws. In addition, a slot is formed at a bottom face of the vise jaws and slidably receives a thin metal chip shield which protects the exposed portion of the threaded screw member.

In an embodiment of the present invention, a vise jaw has a clamping ledge on both faces such that clamping between the vise jaws may be performed at either the inside or the outside bolts on the vise plates.

In an embodiment of the present invention, a central adjustment assembly is included that allows a vise jaw to be utilized to accurately secure relatively small parts at a desired position. The central adjustment assembly may include an L-shaped member with a front portion received on a clamping ledge and having a longitudinally extending bore. An adjustment rod may be received in the bore and adjusted to define a stop at a selected longitudinal position corresponding to the particular small part.

In a further embodiment of the present invention, vise jaws are disclosed having concave curved portions to receive curved members for performing machining operations on the curved member. Alignment bores and bolts ensure the proper positioning of the chuck portions.

These and other objects and features of the present invention can be best understood from the following specification and appended drawings of which the following is a brief description.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a top view of a prior art vise assembly.

FIG. **2** is a top view similar to FIG. **1**, but showing the vise jaws as disclosed by the present invention.

FIG. **3** is a perspective view of a vise jaw as disclosed by the present invention.

FIG. **4** is a view of a rear face of a vise jaw as disclosed by the present invention.

FIG. **5** is a cross-sectional view along lines **5—5** as shown in FIG. **4**.

FIG. **6** is an exploded view of a second embodiment of a vise jaw as disclosed by the present invention.

FIG. **7** is a cross-sectional view, similar to FIG. **5**, but along lines **7—7** as shown in FIG. **6**.

FIG. **8** is a side view of a vise assembly, such as shown in FIG. **1**, but utilizing a vise jaw as disclosed in the second embodiment.

FIG. **9** is a top view of a third embodiment of the vise jaws of the present invention.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

As noted above, a prior art vise assembly **20** is shown in FIG. **1** consisting of a first plate **22** having outside bolts **26** and inside bolts **28**, and a second plate having inside bolts **30** and outside bolts **32**. A threaded screw member **36** has a variable exposed portion **38** in ditch **42** that is vertically below base surface **40** of the vise assembly **20**.

The details of a first embodiment of the present invention will be disclosed with reference to FIGS. **2–5**. As shown in FIG. **2**, a generally rectangular vise jaw **44** having clamping ledge **45** is mounted to first plate **22** while second vise jaw **46** having clamping ledge **47**

opposed to clamping ledge **45**, is mounted to second plate **24**. Chip shield **48** extends between vise jaws **44** and **46** and covers exposed portion **38**. Moving mechanism **34** can be rotated to move second plate **24** along threaded screw member **36** and adjust the clamping distance **39** between vise jaws **44** and **46** for holding a particular part.

Vise jaws **44** and **46** are identical and thus only vise jaw **44** will be explained in detail. As shown in FIG. **3**, vise jaw **44** has clamping ledge **45** defined by clamping face **50** which is of a lesser height than the overall height of vise jaw **44**. The difference in height between clamping ledge **45** and the nominal height of vise jaw **45** is defined as a clamping depth. Access holes **52** extend through the width of vise jaw **44**. Chip shield slot **54** is formed at a bottom face of vise jaw **44** and also extends throughout the width of vise jaw **44**. Bolt hole **56** is formed at a top portion of vise jaw **44**. Access holes **52** are at a height vertically below clamping ledge **45** thus providing a greater clamping surface area.

As shown in FIG. **4**, an attachment face **57** is on the opposite side of vise jaw **44** from clamping face **50** and includes T-shaped openings **58**, which are spaced by a longitudinal distance that corresponds to the longitudinal distance between the pairs of bolts **28**, **30** on a standard prior art vise assembly **20**. T-shaped openings **58** have enlarged portions **60** within the width of vise jaw **44** to receive the heads of bolts **28**, **30**. Access hole **52** extends into T-shaped opening **58** and allows access from clamping face **50** so that bolts **28**, **30**, can be accessed and tightened to secure vise jaws **44**, **46** to first and second plates **22**, **24**. As can also be seen from FIG. **4**, slot **54** extends through the width of vise jaw **44** from clamping face **50** to attachment face **57**.

T-shaped opening **58** extends from the bottom face essentially parallel to the height, or vertical extent of vise jaw **44**. A vertically uppermost portion of T-shaped opening **48** is semi-circular and centered about an axis extending through the center of access hole **52**. Enlarged portion **60** follows the configuration of the rest of T-shaped opening **58**. The semi-circular portion is designed to be at a vertical position corresponding to the height of bolts **28**, **30** when vise jaw **44** rests on base surface **40**. The head of each bolt **28**, **30** is received in enlarged portion **60**, at the semi-circular portion, and is centered upon the center axis of access hole **52**. Access hole **52** has a diameter significantly smaller than enlarged portion **60**, or the diameter of the bolt head, and is dimensioned to be only large enough that a tool, such as a hex wrench, can be inserted. Since access hole **52** is relatively small in diameter, it may be totally vertically below clamping ledge **45** allowing a larger clamping depth and increased clamping surface area. T-shaped opening **58** may also be flared outwardly at a bottom face to facilitate mounting upon a bolt.

FIG. **5** is a cross-sectional view of T-shaped opening **58** which illustrates enlarged portion **60** which is at the top of the T of T-shaped opening **58**. Access hole **52** is shown extending from clamping face **50** to provide access to a bolt that will be received in T-shaped opening **58**.

The operation of a vise **20** employing the improved vise jaw **44** of the present invention will be disclosed. Vise jaws **44** and **46** are mounted upon plates **22** and **24** by sliding T-shaped openings **58** upon a pair of bolts **28** or **30**. A chip shield **48** is placed between the vise jaws **44**, **46** and is aligned with slots **54** at some point prior to securing vise jaws **44**, **46** to the bolts. Chip shield **48** can slide within slots **54** as second plate **24** moves towards and away from first plate **22** and is thin enough that it can be received between second plate **24** and base portion **40** of vise **20**. Thus, chip shield **48** can extend beyond the attachment face **57** of vise jaw **46** should second plate **24** be moved towards first plate **22** to such an extent that chip shield **48** would have extended beyond slot **54** in vise jaw **46**. A securing tool, such as a hex wrench, is now extended through access hole **52** to reach bolts **28** and **30** and tighten them within T-shaped openings **58** to secure vise jaws **44** and **46** to first plate **22** and second plate **24**, respectively. The final vise assembly protects exposed portion **38** of threaded screw member **36** and additionally allows quick mounting of vise jaws **44**, **46**.

A second embodiment of the present invention will now be disclosed with reference to FIGS. **6–8**. As shown in FIG. **6**, a second embodiment of the vise jaw **61** has several features similar to the first embodiment of vise jaw **44** which are identified by the same reference numerals utilized in the first embodiment. Vise jaw **61** also has a second clamping ledge **62** formed on engagement face **57**.

Central adjustment assembly **64**, including L-shaped member **66**, is attached by bolt **67** to bolt hole **56** in the top of vise jaw **61**. Front portion **68** of L-shaped member **66** is received on clamping ledge **45**, or alternatively clamping ledge **62**, and includes bore **70** which receives an alignment rod **72**, that may be adjusted within bore **70**. Alignment rod **72** is longitudinally adjustable within bore **70** to define a stop at a selected position that will be determined by the size of a particular part that is to be clamped. Pin **74** may be inserted into pin hole **76** to lock alignment rod **72** at this selected position. Center adjustment assembly **64** allows the accurate placement and clamping of a part that has a longitudinal extent much smaller than the longitudinal extent of vise jaw **61**. Side alignment hole **78** may also receive a bolt and a stop member to define an end stop of jaw clamp **61**.

FIG. **7** is a cross-sectional view similar to FIG. **5** showing opposed clamping ledges **45** and **62**. The second embodiment of vise jaw **61** is also known as a mirror image vise jaw and allows increased clamping flexibility as will be described below.

As shown in FIG. **8**, the second embodiment of vise jaw **61** may be fixed to outside bolts **32** of second plate **24** with second clamping ledge **62** facing clamping ledge **45** of vise jaw **44**. The height of clamping ledges **45** and **62** is above the height of second plate **24** so that a part may be clamped between vise jaws **44** and **61**. With vise jaw **61**, vise **20** may be utilized with parts requiring a relatively large clamping distance. With this arrangement, chip shield **48** could still be received to cover exposed portion **38** by placing it in slot **54** in vise jaw **44** and allowing second plate **24** to slide over the chip shield **48**.

A third embodiment of the vise jaw **80** of the present invention is illustrated with reference to FIG. **9** and includes first vise jaw **82** and second opposed vise jaw **84**. Vise jaw **82** includes concave curved portion **86** and vise jaw **84** includes concave curved portion **88**. Concave curved portions **86**, **88** are configured to hold a curved member **90**. An alignment pin **92** ensures vise jaws **82** and **84** are aligned at a proper longitudinal position. Alignment bolts **94** extend through alignment bores **96** formed in the attachment faces **57** of vise jaws **82** and **84** to ensure proper circumferential alignment of curved member **90**.

The vise jaws may be soft metal or they may be hardened. They may be manufactured in a variety of sizes to be useful in any clamping situation and with any standard vise. Chip shield may also be of various sizes.

A working embodiment of the present invention has been disclosed, however, a worker in the art would realize that several modifications would be within the scope of this invention and thus the following claims should be considered in order to determine the true scope and content of the present invention.

I claim:

1. A vise jaw comprising:

a generally rectangular member having a longitudinal extent, a height and a width, an attachment face being defined by said longitudinal extent and said height, said attachment face having a pair of openings spaced by a first longitudinal distance, said pair of openings having a generally T-shaped cross-section in a plane defined by said longitudinal extent and said width; and

an access opening extending from each of said openings through said width and allowing access to said openings from a second face on an opposed side of said rectangular member from said attachment face, each of said access openings extending over a first area on said second face and each of said openings extending over a second area on said attachment face, said second area being greater than said first area.

2. A vise jaw as recited in claim **1**, and wherein said second face having a clamping ledge with a height less than the height throughout the remainder of the width of the rectangular member.

3. A vise jaw as recited in claim **2**, and wherein said access hole having a vertically uppermost extent (hat is less than said height of said clamping ledge.

4. A vise jaw as recited in claim **2**, and wherein said attachment face also has a clamping ledge.

5. A vise jaw as recited in claim **2**, and wherein a central adjustment means comprising an L-shaped member is secured to a top face of said rectangular member defined by said longitudinal extent and said width, said L-shaped member having a portion extending towards said clamping ledge, said portion having a bore parallel to said longitudinal extent and receiving an alignment rod, said alignment rod being adjustable along said longitudinal extent to provide an adjustable stop member.

6. A vise jaw as recited in claim **1**, and wherein said first longitudinal distance corresponds to the distance between bolts on a vise assembly.

7. A vise jaw as recited in claim **1**, and wherein said T-shaped openings extend from a bottom face of said rectangular member defined by said longitudinal extent and said width, said T-shaped openings not extending through said height of said rectangular member.

8. A vise jaw as recited in claim **7**, and wherein said bottom face having a slot extending along said longitudinal extent between said T-shaped openings, said slot extending through at least a portion of said width.

9. A vise jaw as recited in claim **8**, and wherein said slot extends through the entirety of said width.

10. A vise jaw as recited in claim **8**, and wherein a thin member being received in said slot and extending outwardly from said rectangular member beyond said width.

11. A vise jaw as recited in claim **1**, and further wherein said rectangular member having a bottom face defined by said longitudinal extent and said width, said bottom face having a slot extending along said longitudinal extent between said T-shaped openings, said slot extending through at least a portion of said width, and a thin member being slidably received in said slot and extending outwardly from said rectangular member beyond said width.

12. A vise jaw as recited in claim **1**, and wherein said T-shaped openings extending from a bottom face of said rectangular member defined by said longitudinal extent and said width, said T-shaped openings having a lower portion extending essentially parallel to said height for the majority of said T-shaped opening, a vertically uppermost portion of said T-shaped opening being semi-circular, said access opening having a central axis, said semi-circular portion of said T-shaped opening being centered about said central axis of said access opening.

13. A vise comprising:

a base mounting a first plate, said first plate having a longitudinal extent and a pair of bolts for mounting a vise jaw, said pair of bolts being separated by a first longitudinal distance;

a second plate also being mounted upon said base and spaced from said first plate by a clamping distance, said second plate having a pair of bolts for mounting a vise jaw, said pair of bolts being separated by said first longitudinal distance;

means for moving said second plate towards and away from said first plate to adjust said clamping distance, said means for moving comprising a screw threaded member extending between said first and second plates and being uncovered throughout said clamping distance; and

vise jaws being attached to both said first and second plates, said vise jaws having a slot at a bottom face thereof, said slots slidably receiving a thin member extending between said first and second plates, said thin rectangular member sliding within said slots as said second plate moves with respect to said first plate and shielding said screw threaded member from machining waste.

14. A vise as recited in claim **13**, and wherein said vise jaws being generally rectangular and having a longitudinal extent, a height and a width, a first attachment face being defined by said longitudinal extent and said height, said attachment face having a pair of openings spaced by said first longitudinal distance, said pair of openings have a generally T-shaped cross-section in a plane defined by said longitudinal extent and said width, an access opening extending from each of said openings through said width and allowing access to said openings from a second face on an opposed side of said vise jaws from said attachment face, one of said pair of bolts being received within said T-shaped openings in one of said vise jaws.

15. A vise comprising:

a base mounting a first plate, said first plate having a longitudinal extent and a pair of bolts for mounting a vise jaw, said pair of bolts being separated by a first longitudinal distance;

a second plate also being mounted upon said base and spaced from said first plate by a clamping distance, said second plate having a pair of bolts for mounting a vise jaw, said pair of bolts being separated by said first longitudinal distance;

means for moving said second plate towards and away from said first plate to adjust said clamping distance; and

said vise jaws being generally rectangular and having a longitudinal extent, a height and a width, a first attachment face being defined by said longitudinal extent and said height, said attachment face having a pair of openings spaced by said first longitudinal distance, said pair of openings have a generally T-shaped cross-section in a plane defined by said longitudinal extent and said width, an access opening extending from each of said openings through said width and allowing access to said openings from a second face on an opposed side of said vise jaw from said attachment face, one of said pair of bolts being received within said T-shaped openings in one of said vise jaws, each of said bolts having a head defining a surface area, each of said access openings extending over an area smaller than the surface area of said bolt heads.

16. A vise comprising:

a base mounting a first plate, said first plate having a longitudinal extent and a pair of bolts for mounting a vise jaw, said pair of bolts being separated by a first longitudinal distance;

a second plate also being mounted upon said base and spaced from said first plate by a clamping distance, said second plate having a pair of bolts for mounting a vise jaw, said pair of bolts being separated by said first longitudinal distance;

means for moving said second plate towards and away from said first plate to adjust said clamping distance; and

said vise jaws being generally rectangular and having a longitudinal extent, a height and a width, a first attachment face being defined by said longitudinal extent and said height, said attachment face having a pair of openings spaced by said first longitudinal distance, said pair of openings have a generally T-shaped cross-section in a plane defined by said longitudinal extent and said width, an access opening extending from each of said openings through said width and allowing access to said openings from a second face on an opposed side of said vise jaw from said attachment face, one of said pair of bolts being received within said T-shaped openings in one of said vise jaws, a vertically uppermost portion of said bolts defining a first vertical position, a vertically uppermost portion of said access openings defining a second vertical position, said second vertical position being lower than said first vertical position.

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